Warm Up # 4-1

$X \sim N(8, 1.3^2)$

$P(X < 7) = 0.221$ Draw the distribution and find:

1. $P(X > 7)$ 2. $P(7 < X < 8)$ 3. $P(X > 9)$

Check your answers (Tan Function Review)

1. 1990 → ≈ 851 million
   1991 ≈ 867 "
   1992 ≈ 883 "

2. $P(x) = 835(1.019)^x$
   2001 → ≈ 1,047 million

3. $f(x) = 19{,}000(0.80)^x$
   $f(5) \approx \$6{,}225.92$

4. a) 0.25
   b) $a = 2$
   c) $y = 1.25$

5 a) B: (2, 7)
   b) x-coordinate of C: 4
   6) graph labeled w/ (0,8) (2,0) (4,0)
   vertex (3, -1)
   axis of sym $x = 3$
   Range: $-1 \le y \le 8$
   Vertex of other function: (5, 6)

7 a) $k = 6$
   b) $y = -1$ and (0, 1)
   c) a) $d = 3.5$
   b) $t \approx 12.5$ years
   c) $d \approx 20.2$

HW Questions: Tan Function Review

Problem #1 : In 1989, the population of India was 835 million people. The annual growth rate was 1.9%. Use this information to predict the population in 1990, 1991, and 1992.

$835 + 0.019(835)$

#2 : Write an exponential function to model India's growth. Use it to estimate India's population in 2001

Growth: $100\% + 1.9\% = 101.9\%$

Multiplier (b) $= 1.019$

exponential model: $y = a(b)^x$

let $x = 0$ in 1989

in 2001

$x = 2001 - 1989$

$x = 12$

$P(x) = 835(1.019)^x$

$\rightarrow P(12) =$

Problem #3 : A typical car depreciates about 20% a year once purchased.

Suppose a $19,000 car loses 1/5 of its value every year. What is its value after 5 years?

$-\frac{1}{5} \rightarrow -20\%$

Multiplier (b)

$100\% - 20\% = 80\%$

$b = 0.8$

Try to write an exponential function to help you answer this question.

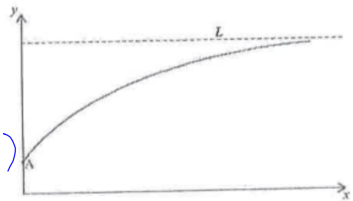
$f(x) =$ ________________

$y = ab^x$

Here is a typical IB exam question:

4. Consider the function $f(x) = -a^{-x} + 1.25$, where a is a positive constant and $x \geq 0$. The diagram shows a sketch of the graph of f. The graph intersects the y-axis at point A and line L is its horizontal asymptote.

(0,)



$$y = -a^{-0} + 1.25$$
$$= -1 + 1.25$$
$$= 0.25$$

(a) Find the y-coordinate of A. **(2)**

The point $\boxed{(2, 1)}$ lies on the graph of $y = f(x)$

$$1 = -a^{-2} + 1.25$$

(b) Calculate the value of a. **(2)**

$$a^{-2} = 0.25$$

(c) Write down the equation of L. **(2)**

$$\frac{1}{a^2} = \frac{1}{4}$$

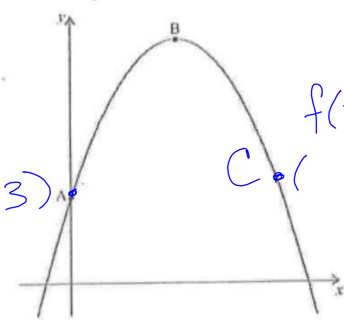
$$a = 2$$

$$f(x) = -2^{-x} + 1.25$$

5. The graph of the quadratic function $f(x) = 3 + 4x - x^2$ intersects the y-axis at point A and has its vertex at point B.

$$f(x) = -x^2 + 4x + 3$$
$$f(x) = -(x^2 - 4x + \underline{4}) + 3 + 4$$

(0, 3)



C (, 3)

$$f(x) = -(x-2)^2 + 7$$

vertex

$$x = -\frac{b}{2a}$$

(a) Find the coordinates of B. $(2, 7)$ **(3)**

Another point, C, which lies on the graph of $y = f(x)$ has the same y-coordinate as A.

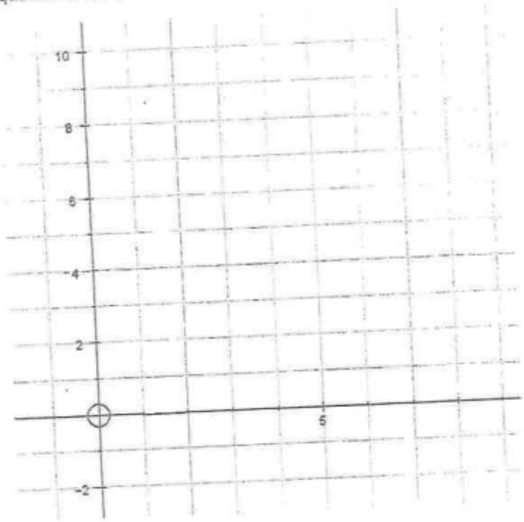
(b) (i) Plot and label C on the graph above. $3 = -x^2 + 4x + 3$

(ii) Find the x-coordinate of C. **(3)**

(Total 6 marks)

6. Factorise the following Quadratic, $f(x) = x^2 - 6x + 8$

Plot it on the axes below for the domain $0 \le x \le 6$ label with the coordinates, the zeros, the y-intercepts and the vertex. Mark on the axis of symmetry and label it with the equation of the line. State the corresponding range of the function.



Where is the vertex of the function $f(x) = (x - 5)^2 + 6$?

7

a. Given $f(x) = k(2)^x$ and $f(2) = 24$, what is the value of k?

b. Given $g(x) = 2^{(x+1)} - 1$, what is the equation of the asymptote and the coordinates of the y – intercept

c. If the diameter of a tree is given by $d = 3.5(2.4)^{0.1t}$, where t is the number of years after planting, find

a) The diameter of the tree when it was planted

b) The number of years it takes for the diameter to triple

$$\frac{3(\cancel{3.5})}{\cancel{3.5}} = \frac{\cancel{3.5}(2.4)^{0.1t}}{\cancel{3.5}}$$

c) The diameter of the tree after 20 years

$$3 = 2.4^{0.1t}$$

$$\ln 3 = \ln 2.4^{0.1t}$$

$$\frac{\ln 3}{0.1(\ln 2.4)} = \frac{\cancel{0.1t(\ln 2.4)}}{\cancel{0.1(\ln 2.4)}}$$

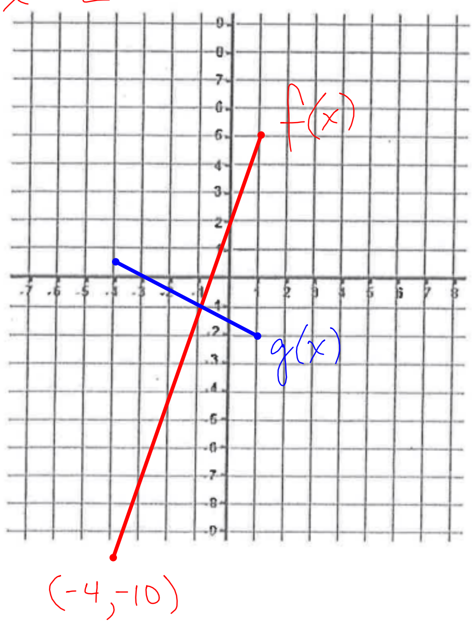
$$t \approx$$

8

f(x) is a linear function with gradient 3 and y – intercept 2, g(x) = -0.5x -1.5 Plot these two lines on the grid below for the domain $-4 \le x \le 1$ and state the coordinates of the intersection of the two lines and the range of the functions.

(gradient = slope)

$f(x) = 3x + 2$



check intersection

$3x + 2 = -0.5x - 1.5$

& solve.

Range of g(x)

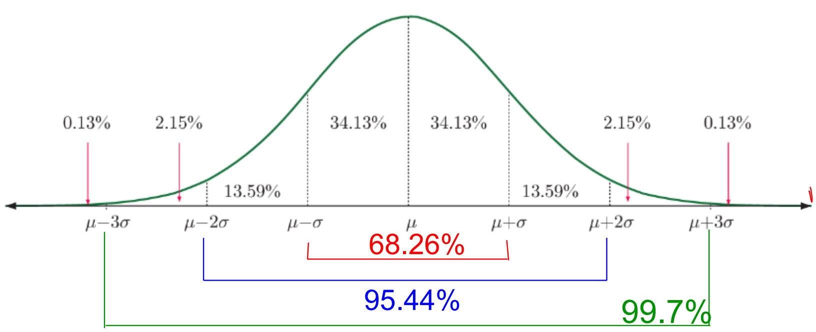
$-2 \le y \le 0.5$

Range of f(x)

$-10 \le y \le 5$

Turn in HW.

The Normal Distribution

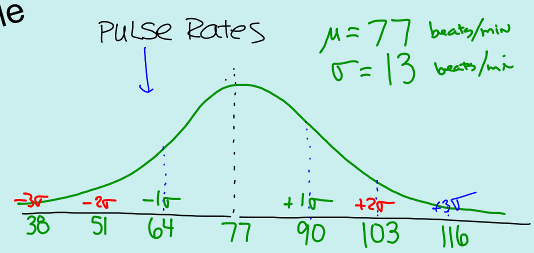


Emperical Rule: 68% / 95% / 99.7%

68% of the data is within one σ of the mean.

95%	"	"	two σ's	"
99.7%	"	"	three σ's	"

Pulse rates example



It is possible to utilize Normal Distribution in your IB Math Studies project, BUT you would have to have data that is likely to be accepted as normally distributed.

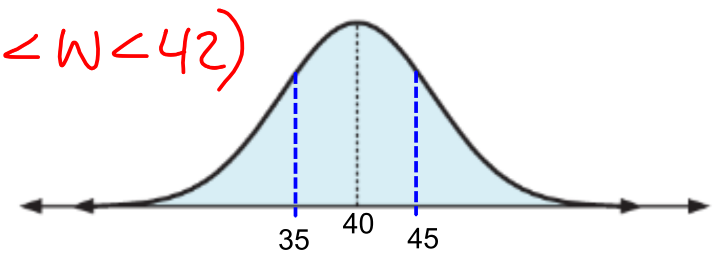
research....

Calculating probabilities with the grapher

Suppose the weights of a bag of potatoes are normally distributed with an average weight of 40 lbs and standard deviation of 5 lbs.

What is the probability that the next bag you buy will be between 38 and 42 lbs?

$P(38 < W < 42)$



2nd DISTR VARS

$P(38 < W < 42)$

normalcdf (38, 42, 40, 5)

lower boundary

upper boundary

μ σ

≈ 0.311

How about P(X > 46) ?

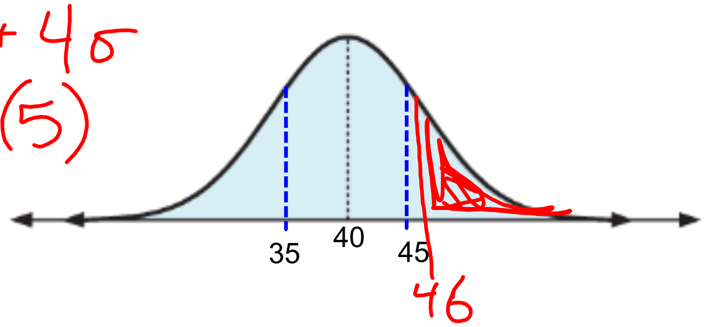
normalcdf (46, <u>60</u>, 40, 5) ≈ 0.115

What is a reasonable upper boundary?

$40 + 4\sigma$

$40 + 4(5)$

60



Tools for editing:

2nd ENTRY / ENTER then arrow keys.

2nd INS / DEL ← insert a character

HW: 10B p. 307, # 1, 4 - 9

Review the two handouts:

*P2 on Gathering Data

*Scoring Criteria for the IA

HW Quiz tomorrow:

pgs. 203, 206, 207, 208, 303